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| 10/788,539 | 02/27/2004 | Xinsheng Sean Ling | L030 P001028-US | 7079 |
| 23483 | 7590 | 06/24/2008 | EXAMINER | |
| WILMERHALE/BOSTON 60 STATE STREET BOSTON, MA 02109 | | BHAT, NARAYAN KAMESHWAR | | |
| | | ART UNIT | | PAPER NUMBER |
| | | 1634 | | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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|------------------------------|------------------------|---------------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 10/788,539 | LING, XINSHENG SEAN | |
| | Examiner | Art Unit | |
| | NARAYAN K. BHAT | 1634 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 21 February 2008.
 2a) This action is **FINAL**. 2b) This action is non-final.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-23 is/are pending in the application.
 4a) Of the above claim(s) 17-21 is/are withdrawn from consideration.
 5) Claim(s) _____ is/are allowed.
 6) Claim(s) 1-16, 22 and 23 is/are rejected.
 7) Claim(s) 12-16 is/are objected to.
 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on 27 February 2004 is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ . |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>10/27/2004</u> . | 6) <input type="checkbox"/> Other: _____ . |

DETAILED ACTION

Election/Restrictions

1. Claims 1-23 are pending in this application.
2. Applicant's election of the invention of group I, claims 1-16 in the reply filed on February 21, 2008 is acknowledged. Applicants have also added new claims 22 and 23, which are dependent from claim 12, which is part of the elected invention of group I, hence new claims are grouped with the invention of group I.
3. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).
4. Claims 17-21 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention of group II there being no allowable generic or linking claim. Election has been treated as an election without traverse (MPEP § 818.03(a)).
5. Claims 1-16, 22 and 23 are under prosecution.
6. Examiner for this application has changed. Please address all future correspondence to Dr. Narayan K. Bhat, Art Unit 1634.

New Claims

7. New claims 22 and 23 have been reviewed and entered.

Claim Objections

8. Claim 12 is objected to because of the following informalities: Claim recitation of “monitoring the change is the size” appears to have a typographical error. It is suggested that replacing the word “is” with “in” to make the claim recitation clearer. Appropriate correction is required.

Claim Rejections - 35 USC § 112

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. Claims 13-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

11. Claim 13 recites the limitation “the diameter of said polymer molecule” in line 10. There is insufficient antecedent basis for “the diameter” and “the polymer molecule” limitation in the polymer material in line 6, which is not defined by a diameter. It is suggested that the diameter of the polymer material be set forth in the claim at the first recitation of the polymer material.

12. Claims 14-16 are indefinite because they are dependent from claim 13.

13. The phrase "larger than approximately 100 nm" in claim 22 is a relative term which renders the claim indefinite. The phrase "larger than" however, is contraverted by the term "approximately", which implies that the values above and below 100 nm. The phrase "larger than approximately" is not defined by the claim, the specification does not

provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

14. The phrase "less than approximately 100 nm" in claim 23 is a relative term which renders the claim indefinite. The phrase "less than" however, is contraverted by the term "approximately", which implies that the values above and below 100 nm. The phrase "less than approximately" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

16. Claims 1-8 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fleming (USPN 6,503,409 issued Jan. 7, 2003, cited in the IDS filed on 2/27/2004) in view of Coles (USPN 5,314,829 issued May 24, 1994).

Regarding claim 1, Fleming teaches a process to fabricate pores comprising the steps of: providing a substrate member having a thickness (Fig. 4, # 400) and a first (Fig. 4, # 403) and a second opposing surfaces (Fig. 4, # 401). Fleming also teaches forming at least one channel lengthwise in a first direction in first surface (Fig. 4, # 404)

and forming at least one second channel lengthwise in a second direction in said second surface (Fig. 4, # 402). Fleming further teaches that the second direction being disposed at a 90 degree angle relative to said first direction (column 4, lines 41-49).

Fleming also teaches that the first channel and said second channel extend inwardly from said first and second surfaces and intersect at a point to form an aperture, i.e., pore (Fig. 4, # 405), defining a pore extending through said substrate member from said first surface to said second surface (column 4, lines 41-54). Fleming teaches forming narrow trench, having a wider opening and narrower bottom (Fig. 1C, # 111), but is silent about V-shaped channel.

Regarding claims 2 to 4, Fleming are silent about forming a plurality of channels on the first and second surface.

Regarding claim 5, Fleming teaches that the substrate member is silicon (Fig. 2, # 200, column 3, line 45).

Regarding claim 6, Fleming teaches that the substrate member has a surface layer comprising silicon dioxide and silicon nitride (Fig. 2, # 201 and 203, column 3, lines 44-52).

Regarding claim 7, Fleming teaches that the steps of forming first and second channels are by etching (column 4, lines 29-30).

Regarding claim 8, Fleming teaches that the pore has width of a few nanometers or even one nanometer, which is between about one nanometer and 100 micrometer as claimed (column 3, lines 25-32).

Regarding claim 23, Fleming teaches that the nano-aperture, i.e., nanopore has width of few nanometers or one nanometer, which is less than approximately 100 nanometers (column 3, lines 25-32).

Regarding claims 1-4, Fleming is silent about V-shaped channels and a plurality of V-shaped channels on the substrate. However, a plurality of V-shaped channels on the substrate were known in the art at the time of the claimed invention was made as taught by Coles, who teaches a substrate (Fig. 1, # 10) with 1000 grooves, i.e., channels per die (Fig. 1, Groove # 30, Die # 15, column 3, lines 10-15) and further teaches each channel is V-shaped (Fig. 2, column 3, lines 21-22). Coles also teaches that the V-shaped channels formed on the substrate are parallel (Fig. 1, # 20). The combined teachings of Fleming and Coles would provide a plurality of V-shaped channels on the first surface and a plurality of V-shaped channels on the second surface and wherein plurality of first V-shaped channels and a plurality of second V-shaped channels intersect at an array of points defining an array of pores extending through substrate from the first surface to the second surface. Coles also teaches that the V-shaped channels allows biomolecules slide easily in the channel and well suited for scanning by atomic microscope for real time data analysis (column 4, lines 8-10 and 25-28).

It would have been prima facie obvious to one having the ordinary skill in the art at the time the invention was made to modify the pore fabrication method of Fleming with the V-shaped channels on the surface of Coles with a reasonable expectation of success.

An artisan would have been motivated to modify the pore fabrication method of Fleming with the V-shaped channels on the surface of Coles with the expected benefit of sliding biomolecules easily into channel for easy scanning by atomic microscope for real time data analysis as taught by Coles (column 4, lines 8-10 and 25-28).

17. Claims 1-3 and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fleming (USPN 6,503,409 issued Jan. 7, 2003) in view of Coles (USPN 5,314,829 issued May 24, 1994) as applied to claims 1-3 above and further in view of Fritsch et al (USPGPUB NO. 2002/0058279 published May 16, 2002).

Claims 10 and 11 are dependent from claims 2 and 3 respectively. Claims 2, 3 and 9 are dependent from claim 1. The teachings of Fleming and Coles with regard to claims 1-3 are described in this office action in section 16.

Regarding claims 9-11, Coles teaches capacitor plates on the side of the die to apply electric field to the channel (column 4, lines 15-19), thus providing for electrically addressable pore. Fleming in view of Coles is silent about individually electrically addressable array of pores. However, individually electrically addressable array of pores was known in the art at the time of the claimed invention was made as taught by Fritsch et al who teaches method for fabrication pores comprising array of pores (Fig. 5) and further teaches that each pore includes independently addressable electrodes (Fig. 6, Fritsch et al , claim 4). Fritsch et al also teaches individually addressable electrodes as integral component of the pore makes them an excellent self-contained analysis unit in

small volumes (paragraph 0021). The combined teachings of Fleming, Coles and Fritsch et al would provide individually electrically addressable array of pores.

It would have been *prima facie* obvious to one having the ordinary skill in the art at the time the invention was made to modify the pore fabrication method of Fleming and Coles with the method of fabricating individually electrically addressable electrodes as integral component of the pore of Fritsch et al with a reasonable expectation of success.

An artisan would have been motivated to modify the pore fabrication method of Fleming and Coles with the method of fabricating individually electrically addressable electrodes as integral component of the pore of Fritsch et al with the expected benefit of making individually electrically addressable electrodes as integral component of the pore as an excellent self-contained analysis unit in small volumes as taught by Fritsch et al (paragraph 0021).

18. Claims 1, 12 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fleming (USPN 6,503,409 issued Jan. 7, 2003) in view of Coles (USPN 5,314,829 issued May 24, 1994) as applied to claim 1 above and further in view of Storm et al (Nature Materials, 2003, 2, 537-540, cited in the IDS filed on 2/27/2004).

Claims 12 and 22 are dependent from claim 1. Teachings of Fleming and Coles with regard to claim 1 are described in this office action in section 12.

Regarding claim 12, Fleming teaches oxidizing the substrate (column 3, line 54) but is silent about heating the substrate member adjacent to the aperture reducing the

size of the pore. However, heating the substrate member adjacent to the aperture reducing the size of the pore was known in the art at the time of the claimed invention was made as taught by Storm et al, who teaches fabrication method for generating 20 to 200 nanometer pores on a silicon substrate by thermally oxidizing and fine tuning the size of the pore with nanometer precision using focused ion beam (Fig. 3, pg. 537, column 1, paragraphs 2 and 3). Storm et al also teaches electron beam provides energy to soften the solid material around the aperture by heating (pg. 539, lines column 1, paragraph 1). Storm et al further teaches the monitoring the change in the size of the aperture using TEM microscope and visual feed back of the subnanometer structure by the TEM scope thus teaching electronic feedback loop and further teaches stopping said heating when the size of the pore is reduced to a predetermined size (pg. 537, column 1, paragraph 1, pg. 540, column 1, paragraph 1).

Regarding claim 22, Storm et al teaches that pore is 200 nm (pg. 537, column 1, paragraph 1), thus teaching a micropore as defined in the claim, i.e., said aperture is a micropore when the width of the said aperture is larger than 100 nm.

Storm et al also teaches modulation of the width of the nanopore dramatically increases the level of control in the fabrication of a wide range of nanodevices (pg. 537, column 1, paragraph 1). The combined teachings of Fleming, Coles and Storm et al would provide a micropore when the width of aperture is larger than 100 nm.

It would have been prima facie obvious to one having the ordinary skill in the art at the time the invention was made to modify the pore fabrication method of Fleming,

Coles with the pore modulation method of Storm et al with a reasonable expectation of success.

An artisan would have been motivated to modify the pore fabrication method of Fleming, Coles with the pore modulation method of Storm et al with the expected benefit of dramatically increasing the level of control in the fabrication of a wide range of nanodevices as taught by Storm et al (pg. 537, column 1, paragraph 1).

19. It appears that the subject matter of claims 13-16 is free and clear of prior art. Claims 13-16 are objected to as being dependent upon a rejected base claim 1, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

20. No claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Narayan K. Bhat whose telephone number is (571)-272-5540. The examiner can normally be reached on 8.30 am to 5 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ram R. Shukla can be reached on (571)-272-0735. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Narayan K. Bhat/
Examiner, Art Unit 1634
Narayan K. Bhat Ph. D.

/BJ Forman/
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